

(No Model.)

3 Sheets—Sheet 1.

F. MANSFIELD.
ELECTRIC RAILWAY.

No. 478,346.

Patented July 5, 1892.

Fig. 1.

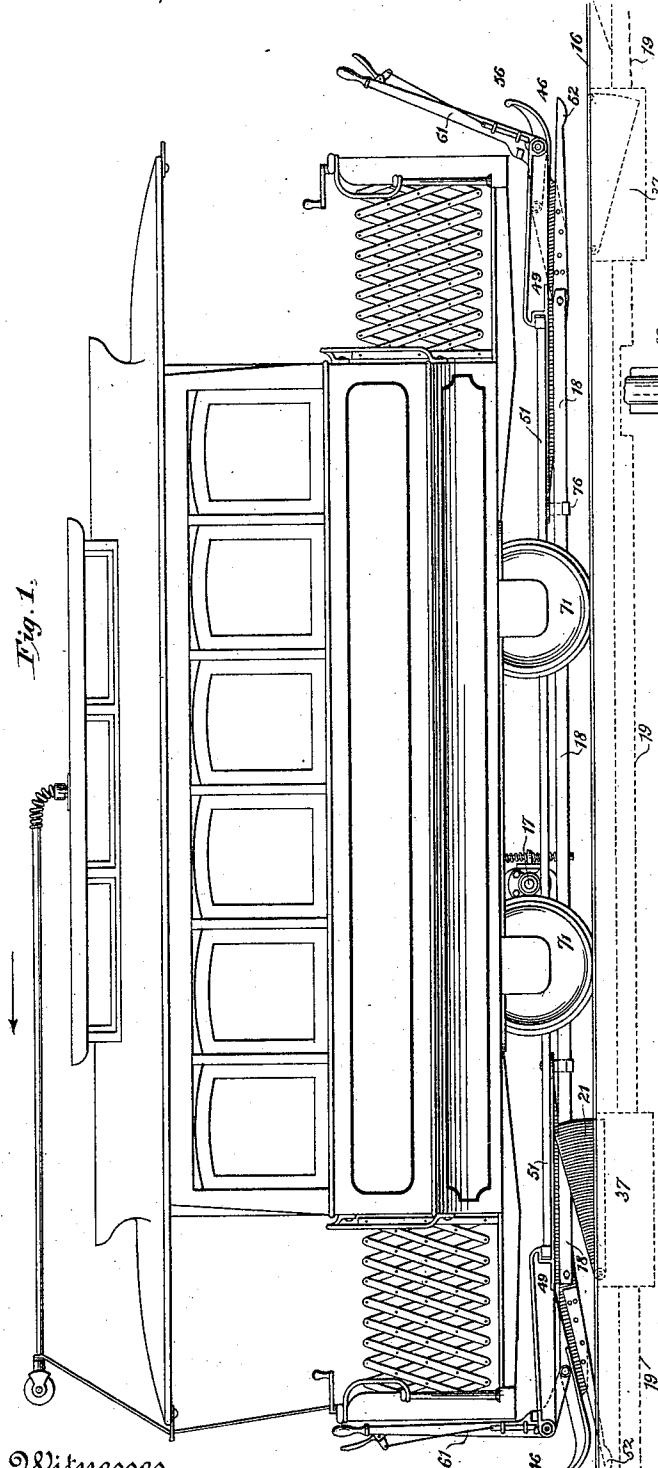


Fig. 12.

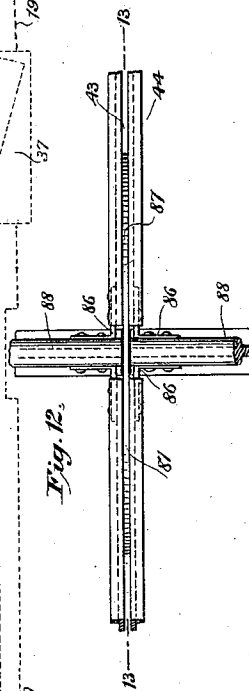


Fig. 13.

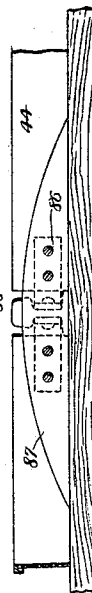
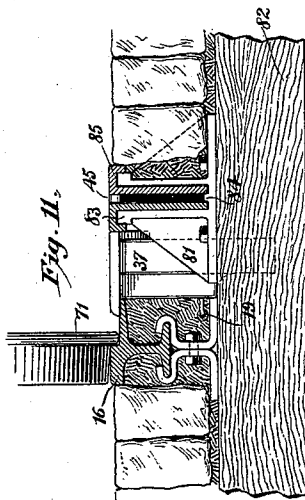


Fig. 11.



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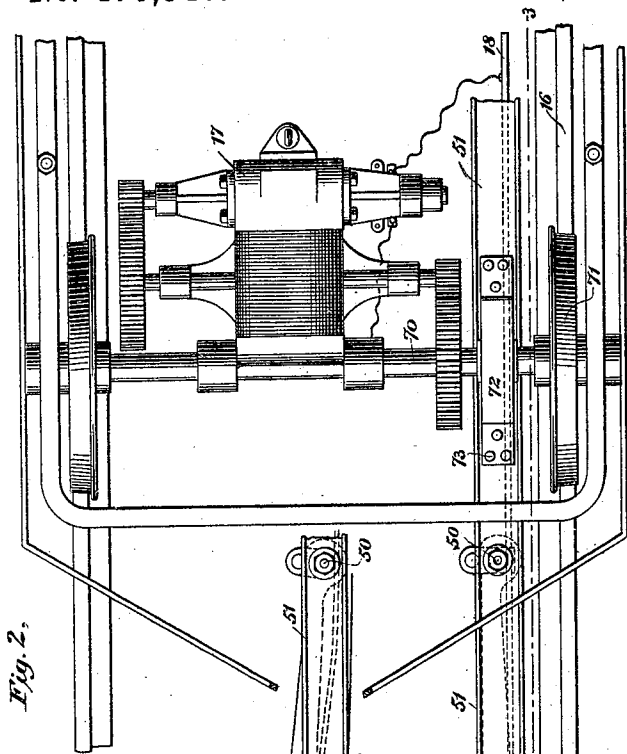


Fig. 2.

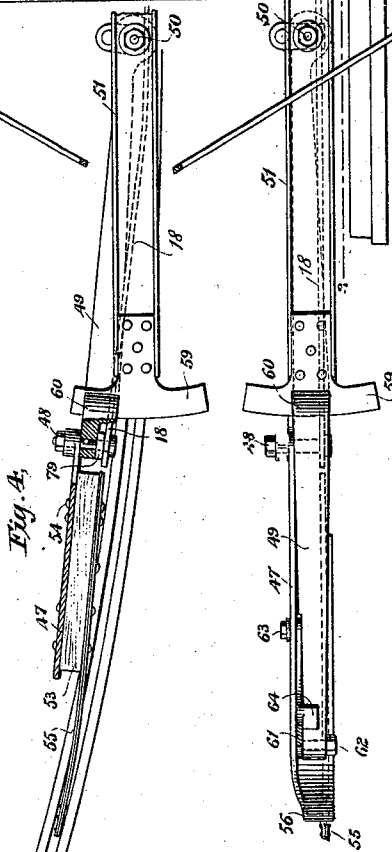


Fig. 3.

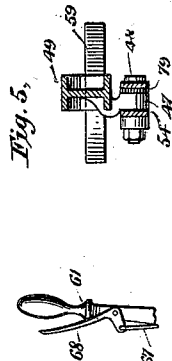


Fig. 4.

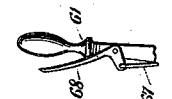


Fig. 5.

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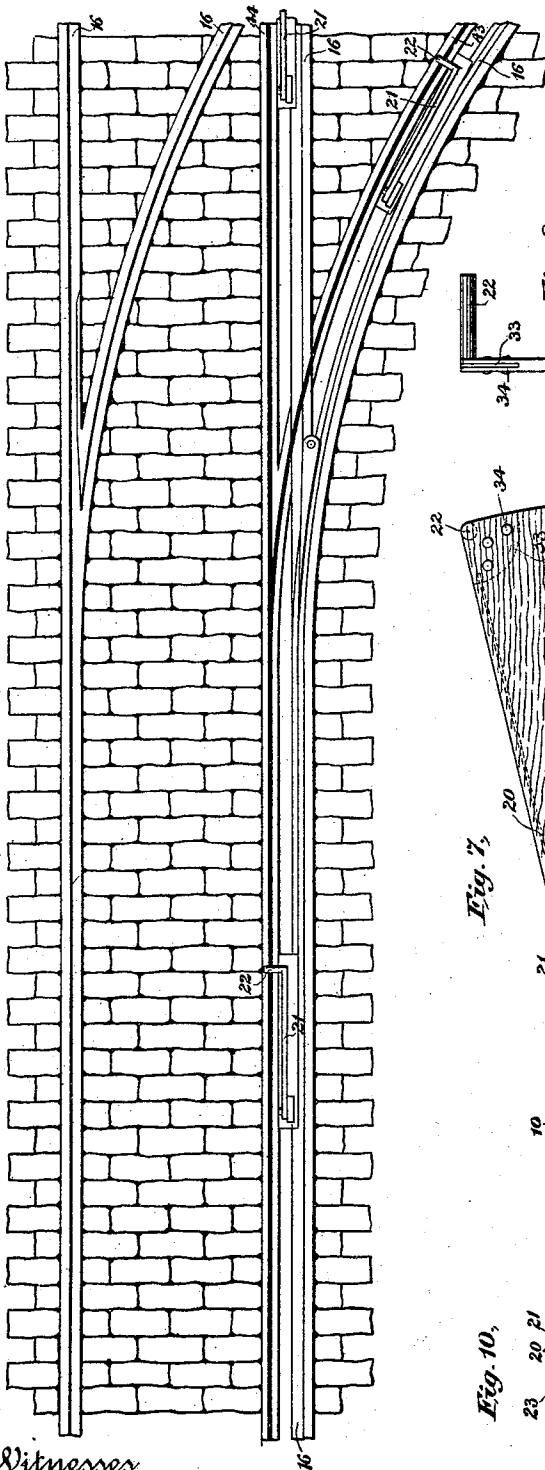
3 Sheets—Sheet 3.

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Fig. 6.



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Fig. 8.

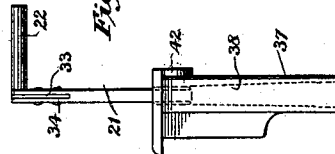


Fig. 7.

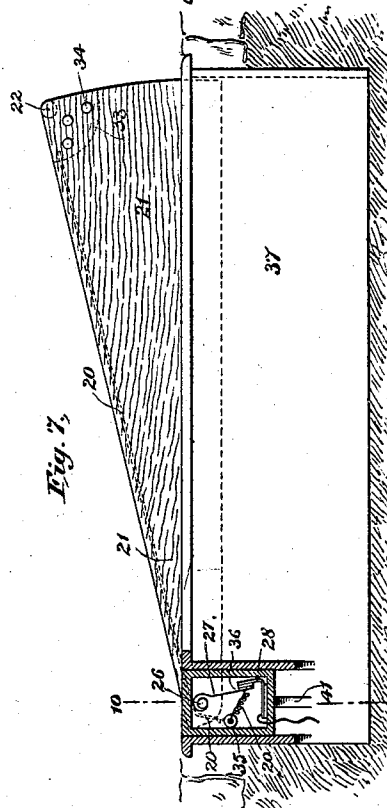


Fig. 9.

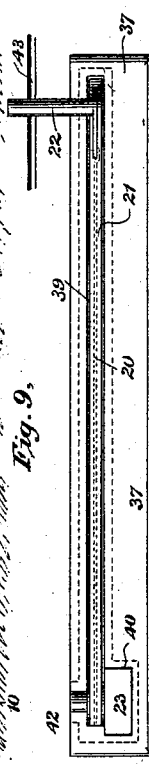
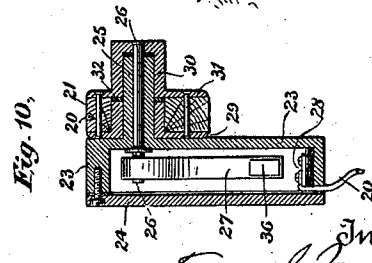


Fig. 10.



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UNITED STATES PATENT OFFICE.

FRANK MANSFIELD, OF NEW YORK, N. Y.

ELECTRIC RAILWAY.

SPECIFICATION forming part of Letters Patent No. 478,346, dated July 5, 1892.

Application filed November 18, 1890. Serial No. 371,824. (No model.)

To all whom it may concern:

Be it known that I, FRANK MANSFIELD, a citizen of the United States, residing at New York, county and State of New York, have
5 invented certain new and useful Improvements in Electric Railways, of which the following is such a full, clear, and exact description as will enable any one skilled in the art to which it appertains to make and use the
10 same, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to electric railways of the class described in the patents granted
15 to me July 22, 1890, and numbered 432,673, 432,674, and 432,675, respectively, in which a main conductor is provided at intervals along the way with normally-disconnected insulated branch conductors which are automatically
20 connected in circuit and placed in contact with circuit-completing mechanism on the car by means of a pick-up device carried by the car.

The invention relates especially to certain
25 improvements in the pick-up device or plow carried by the car, the supporting means for the same, and the circuit-completing mechanism on the car, the switch for connecting the branch conductor with the main and disconnecting it therefrom, and the operating-lever
30 for controlling the switch and making contact with the circuit-completing mechanism on the car, and the casing for the said switch and operating-lever; and it further relates to certain
35 improvements in the conduit in which the pick-up plow travels.

In the accompanying drawings, illustrating my invention, Figure 1 is a side view of an electric car provided with my improvements.
40 In this view the pick-up plow at the forward end of the car is shown as lowered into position for use, while the one at the rear end thereof is shown as elevated and out of use. The conduit in which the pick-up plow travels
45 and the casings containing the branch conductors, their switches, and operating-levers are shown as dotted in the road-bed. Fig. 2 is an enlarged plan view of a portion of the running-gear of the car with my improved pick-up plow mounted thereon. Fig.
50 3 is a sectional view of the parts shown in Fig. 2, the section being taken on a plane in-

dicated by line 3 3 in Fig. 2. This view, in addition to that of Fig. 2, shows the conduit in which the pick-up plow travels. Fig. 4 is
55 a top plan view of my improved pick-up plow shown in the position that it assumes when the car is rounding a curve, a portion of the supporting means, the hand-lever, and the guard being here omitted. Fig. 5 is a sec-
60 tional view taken on a plane indicated by line 5 5 in Fig. 3. Fig. 6 is a plan view of the railway-tracks at a turn-out or switching-point and shows the conduit, the switch for the branch
conductors, and their operating-levers which
65 are located in the road-bed. Fig. 7 is a side view of the casing containing the switch for the branch conductor and its operating-lever, the switch-box being shown in vertical section and the operating-lever being shown as ele-
70 vated to its upper limit of movement. Figs. 8 and 9 show an end view and a top plan view, respectively, of the parts shown in Fig. 7. Fig. 10 is an enlarged detached view, in section,
75 of the switch-box and the operating-lever, the plane of the section being indicated by line 10 10 in Fig. 7. Fig. 11 is an enlarged cross-sectional view of the conduit in which the pick-up plow travels and shows the relative position
80 of the switch-box of the branch conductor and its operating-lever. Fig. 12 is a top plan view of the conduit and the rail of a crossing-track. Fig. 13 is a sectional view taken on a plane indicated by line 13 13 in Fig. 12.

In the said drawings, like numbers of refer-
85 ence indicate like and corresponding parts throughout.

Referring to the drawings, 15 designates an ordinary form of an electric car moving on the
90 usual railway-tracks 16 and which is provided with a propelling electric motor 17. The motor 17 is electrically connected with the circuit-completing rod 18, which is carried beneath the car and which may be placed in
95 circuit with a subterranean main conductor 19 through means of the normally-disconnected insulated branch conductors 20, which are brought into operation by a moving car, as hereinafter to be described.

The main or supply conductor 19 is located
100 in a suitable manner in the road-bed, and at certain intervals along the same are arranged the branch conductors 20, which are insulated throughout, and each lead through a

switch over a pivoted operating-lever 21, upon the end of which they are provided with a contact-piece 22, which, as hereinafter described, is designed and adapted to be engaged by the pick-up plow on the car and placed thereby in contact with the contact-bar 18 on the car. The switch for the branch conductor 20 is located within the water-tight box 23, provided with a removable side 24 and having a tubular shaft or sleeve 25 leading into one side thereof. The shaft 25 is fixed to the switch-box, and through the shaft passes a rotary shaft 26, one end of which extends into the switch-box and is provided with a spring contact-arm 27, the end of which carries a contact-plate which engages a second contact 28, located in the bottom of the switch-box. The operating-lever 21 is mounted upon the shaft 25, so as to turn thereon, by means of a sleeve 29, and a cap 30 is mounted upon the end of the shaft 25 and is connected with the end of the switch-shaft 26 and with the operating-lever 21, so that the lever 21 and the shaft 26 move together in fixed relation. The sleeve 29 and the cap 30 can be made in a single piece, if preferred; but in the present construction they are made separate and are bolted together by means of the bolts 31, which pass through the body of the lever 21. A washer 32 is placed between the end of the sleeve 29 and the cap 30 to prevent water from working its way into the switch-box. This construction serves to prevent water from finding its way into the switch-box along the switch-shaft 26. The contact carried upon the end of the lever 21 consists in a laterally-projecting metallic arm or bar 22, which extends from a plate 33, that is let into the end of the lever 21 and secured in position by the bolts 34. The plate 33 is connected with the branch conductor 20, leading over the lever, which conductor is insulated throughout and passes from the lever into the side of the switch-box at a point 35, thence runs to the contact 36 upon the end of the arm 27, the other portion of the branch conductor being from contact 28 over the conductor 20 to the main. Water-tight joints are formed in the switch-box at points where the conductor 20 passes in and out. The parts of the switch are so adjusted that when the lever 21, by which the switch is operated, is raised to its highest point of movement, as shown in Figs. 1, 7, 8, and 9, the switch is closed, so that the contact 22 upon the end of the lever will be energized. When the operating-lever is at its lowest point of movement or at any point intermediate the lowest point and the highest, the switch is open. In this way the branch conductor is only in circuit with the main when a passing car has moved the lever 21 to its highest point of movement and placed the contact 22 in contact with the bar 18 on the car. Since the point of contact between the mechanism on the car and the contact-point 22 of the branch conductor is at a considerable distance above the surface of the road-

way and the parts are all thoroughly insulated and protected against water, any ordinary amount of surface water will not be likely to cause a short circuit of the current.

The switch-box 23 and the lever 21, together with the cap 30 and the parts connected therewith, are all secured together and are mounted in a casing 37, which may be made of a suitable metal formed in any suitable shape. This casing 37 is provided with a chamber 38, which opens at 39 along the top of the casing, and a recess 40 is formed at one end of the chamber for the reception of the switch-box 23, the bottom of which is supported by a lug or projection 41, fixed upon the casing. A depression 42 is formed in the casing opposite the recess 40, and the cap 30 rests in the same as a bearing when the parts are properly seated in position, as shown in Fig. 9. By this means should it become necessary to adjust or repair the switch this may be readily accomplished by lifting the switch-box, together with the lever 21, out of the casing and then removing the top 24 of the box, the part of the branch conductor 20 between the switch and the main conductor being sufficiently slack to allow the switch-box to be raised at least its entire height.

The operating contact-lever 21 may be made of any suitable insulating material, such as wood, and is formed like a broad flat plate or blade and is somewhat triangular in shape when viewed from the side. This opening 39 of the casing is of a sufficient width to allow the lever 21 to be swung in and out of the casing, there being as little clearance as possible between these parts. The lever is of such a width that when raised to its highest point of movement a portion of it is still within the casing, as shown in the drawings, so that it serves to keep the opening 39 closed at all points of its movement, and in this way foreign matter is prevented from falling into the casing through the opening in which the lever works. The chamber 38 of the casing gradually widens from the top the bottom thereof, as will be understood from Fig. 8, so that should any foreign matter find its way into the same it will not prevent the lever 21 from being lowered to its lowest point of movement, since by this construction considerable room is left in the bottom of the chamber 38 between the sides of the lever and the walls of the chamber.

The contact-piece 22 at the end of the movable branch conductor extends across the guide-slot 43 of the conduit 44, which is placed in the road-bed parallel with the track. In the present construction this conduit is located to one side of the track near one of the rails, though of course it may be placed centrally of or to the outside of the rails. The top of the casings 37 lie flush with the surface of the road, likewise the conduit, in the upper edge of which is formed a transverse notch 45 for the reception of the contact-piece

22, which is designed and constructed to extend across the slot of the conduit, so that it may be engaged and raised by the pick-up device or plow on the car, in order to connect the branch conductors with the main and the circuit-completing mechanism on the car, as before described.

The pick-up plow 46 is a mechanical one, and consists in a plate 47, hinged vertically on a pin 48, which is mounted upon a downward extension of a swinging supporting-bar 49, which at its inner end is swiveled on a vertical pin 50, mounted upon the supporting-beam 51. The plow-arm 52 is attached to the plate 47, so that its outer end projects free therefrom a considerable distance. This plow-arm may be made integral with the plate 47; but in the present construction it is made separate and is insulated from it by means of an insulating-block 53, through which pass the bolts 54, which secure the arm 52 to the plate. The plow-arm 52 is flexible, so that it may be bent sidewise in taking a curve, as shown in Fig. 4. The arm may be made of one thickness of suitable metal, or it may be laminated, as shown in the drawings, wherein it consists in two flat plates 55, secured together by rivets. At the same time the outer one of them is capable of a slight lengthwise movement on the other, so as to permit of the arm being flexed at its end as the car passes around a curve. The slots in the plates 55, through which the bolts 54 pass, are elongated to permit of the plates moving on each other, as clearly illustrated in Fig. 3. A curved projection or horn 56 extends from the plate 47 above the end of the plow, and a guard-rib 57 runs from this horn along the plate parallel with the plow-arm and directly above the same, so as to form a guard for the contact-piece 22 as the plow moves under the same and elevates it. A spring 58 extends from the end of the guard-rib 57 and engages with its end the under side of the supporting-bar 49. This spring serves to bridge over the space between the inner end of the guard-rib 57 and the supporting-bar.

The supporting-bar 49 is hinged on a bolt 50, so that it may be swung thereon horizontally sufficiently to allow the plow which runs in the conduit to easily move around a curve in the conduit, as will be understood more especially from Fig. 4. This supporting-bar 49 extends slightly beyond the end of the car and almost to the end of the plow, and it is supported between its ends by the end of the supporting-beam 51, the end of which is provided with a curved guide-plate 59, which is placed horizontally and is engaged by a projection or lip 60 on the supporting-bar 49, so that a sliding joint is formed between these two parts in order that the supporting-bar may be swung from side to side on the bolt 50 as a center. Upon the end of the supporting-bar 49 is mounted a hand-lever 61, which is bent somewhat L-shaped, and is pivoted at the bend thereof on a pin 62. The foot of

the lever 61 is pivoted at 63 to the plow 46, so that by moving the lever on the pivot 62 the plow may be raised from the conduit or lowered into it, the limit of the downward movement of the plow being regulated by a stop 64, fixed upon the hand-lever 61 and engaging the supporting-bar 49. The hand-lever may be locked in position when the plow is raised to its highest point by means of a lug 65 on the supporting-bar 49 and a spring-bolt 66, mounted upon the hand-lever and connected by means of a cord or rope 67 with a pivoted handle or trigger 68, located at the upper end of the hand-lever 61. The pivoted handle 68 and the handle of the lever 61 are placed near together and they both may be grasped by one hand, so that the hand-lever may be unlocked and the plow lowered into operative position by one and the same movement, an outward movement of the hand-lever serving to raise the plow out of the conduit and above the road-bed, while the reverse movement serves to unlock it and lower it into position.

The supporting-beam 51 in the present construction consists in a channel-bar placed horizontally under the car to one side thereof, and it is supported from the car-axles upon which are mounted the car-wheels. This supporting-beam extends a little over the entire length of the body of the car, but does not extend beyond the platforms thereof, and it is swung from the axles by means of the hangers or brackets 72, which are secured to the beam by means of bolts 73. The bearing-block 74 of one of the axles is mounted in the hanger 72, so as to be movable horizontally thereon in a direction lengthwise of the car. This block slides between the hanger and the beam, as clearly shown in Fig. 3, and is provided at each end thereof with a spring 75, which is placed between the block and the hanger and acts to oppose the movement thereof. A rigid connection between the car-axles and the supporting frame or beam 51 is thus avoided and the beam is relieved of any stress which the axles would otherwise exert upon it when the car is passing over a curve, since any movement of the axles out of parallelism is allowed for.

The contact-bar 18 is suspended below the supporting-beam 51 by means of insulated hooks 76, which depend from the beam. This bar 18 extends from the plow at the forward end of the car to the one at the rear end, and at each end it is connected with the pin or bolt 48 by means of an elongated slot 77, and the upper edge of the bar is slightly inclined at 78 at each end, so that when the plow is lowered into position this incline 78 will be on about a plane with the upper edge of the plow-arm 52, in order that the contact-bar may run smoothly under the contact 22 as the same leaves the plow at its upper end. The contact-bar 18 is flexible at its ends, so that when the plow is forced to one side by a curve in the conduit the bar may bend slightly, in

order to allow the plow to pass smoothly over the bend. The contact-bar of course is to be suitably insulated at all points of its support, and to this end an insulating-washer 79 is placed on the bolt 48 between the contact-bar and the supporting-bar 49, as shown in Fig. 4. The contact-bar 18 and the arm 52 of the plow are arranged so as to form, practically, a continuous bar for passing under the contacts 22 as the car advances.

As before stated, the contact-bar 18 is in circuit with the motor 17, so that when the plow has raised one of the operating-levers 21 to such a height that the contact 22 thereof comes in contact with the bar 18 a circuit will be established from the main conductor through the branch conductor, thence by the contact-bar 18 to the motor 17, and thence by a suitable return-conductor, which may either be by one of the tracks or a suspended or buried wire, to the dynamo. The branch conductors are arranged at such distances from each other that as soon as one is about to break circuit with the contact-bar 18 another one at the forward end of the car is brought into circuit by the forward pick-up plow. In this way one of the branch conductors is always connected between the main and the contact-bar 18, so as to admit the current to the motor.

The conduit 44 is composed of two vertically-arranged plates 80, suitably spaced and forming a guide-slot 43 for the end of the plow to travel in, and is supported by means of chairs 81, which are formed in one piece and bolted to the cross-ties 82. The chairs 81 have two vertical pillars 83, which are suitably spaced to receive the conduit, and the base of each chair is formed upon its upper face with a projection 84, which takes in between the two plates 80 forming the conduit and serves to hold them apart at their lower edges. The upper ends of the conduit-plates are held stationary by means of a lip 85, hooking over the upper ends of the pillars or uprights 83 of the chairs, as fully shown in Fig. 11. At the point where a railway-track crosses the conduit the same is cut away a distance about equal the width of the crossing-rail, as shown in Figs. 12 and 13. The abutting ends of the crossing-rails 88 are spaced a little more than the width of the guide-slot 43 of the conduit, so as to permit the plow traveling in the conduit to move between the ends of the rail, which are secured to the adjacent sides of the conduit by means of the angle-irons 86. At this point a spacing-plate 87 is inserted in the conduit, so as to stand vertically, and the upper surface thereof is bowed or curved in such a way that the plow as it advances along the conduit will strike the spacing-plate 87 and slide easily over the same.

In the operation of the railway it is preferable to use a plow at each end of the car and to have both of them lowered, so that as the forward plow gradually raises the operating-levers of the branch conductors into contact

with the mechanism on the car the rear plow may serve to gradually lower the same into their normal position in the road-bed as the car recedes. However, but one plow need be used, and that may be at the forward end of the car, in which case the rear end of the contact-bar 18 may be provided with an inclined end which would extend to within a sufficient distance of the surface of the roadway to just clear the same, so that as the contact-bar moves under and beyond the supporting contact-lever the latter may gradually be lowered and finally gravitated into its normal position.

Having thus described my improvements in electric railways, what I claim, and desire to secure by Letters Patent, is—

1. In an electric railway, the combination, with a car provided with a contact device, of a conduit having a guide-slot extending along the roadway and movable contacts arranged along the way and adapted to be brought into engagement with the said contact device on the car, and a movable pick-up plow mounted upon the car and hinged upon a horizontal axis, so that it may be raised out of the guide-slot when not in use, for the purpose set forth.

2. In an electric railway, the combination, with a car provided with a contact device, of a conduit having a guide-slot extending along the roadway and movable contacts arranged along the way and adapted to be brought into engagement with the said contact device on the car, and a movable pick-up plow mounted upon the car and hinged so that it may be moved into and out of the guide-slot, and a lock for holding it elevated out of the slot, for the purpose set forth.

3. In an electric railway, the combination, with a car provided with a contact device, of a conduit having a guide-slot extending along the roadway and movable contacts arranged along the way and adapted to be brought into engagement with the said contact device on the car, and a movable pick-up plow mounted upon the car and hinged so that it may be moved into and out of the guide-slot, and a hand-lever connected to the plow for controlling its movement.

4. In an electric railway, the combination, with a car provided with a contact device, of a conduit having a guide-slot extending along the roadway and movable contacts arranged along the way and adapted to be brought into engagement with the said contact device on the car, and a movable pick-up plow mounted upon the car and hinged so that it may be moved into and out of the guide-slot, a hand-lever pivoted to the plow for raising and lowering it, and a lock for holding the plow in raised position, and connections extending from the lock along the hand-lever to the handle thereof, for the purpose set forth.

5. In an electric railway, the combination, with a car provided with a contact device, of a pivoted supporting-bar and a pick-up plow hinged thereto on an axis at right angles to

the pivotal axis of the supporting-bar, whereby the plow may be moved laterally, as well as raised and lowered, for the purpose set forth.

5 6. In an electric railway, the combination, with a car provided with a contact device, of a horizontally-swinging supporting-bar, a horizontal guide engaging the supporting-bar intermediate its ends, so as to support the bar
10 as it is swung on its joint, and a pick-up plow attached to said supporting-bar, for the purpose set forth.

7. In an electric railway, the combination, with a car provided with a contact device, of
15 a horizontally-swinging supporting-bar, a movable pick-up plow hinged to the supporting-bar, so that it may be raised and lowered, and a hand-lever mounted upon the supporting-bar and pivoted to the plow for controlling the movements of the same, for the purpose
20 set forth.

8. In an electric railway, the combination, with a car provided with a contact device, of movable devices arranged at intervals along
25 the roadway for controlling the circuit, a pick-up plow mounted upon the car for engaging and raising the said movable devices into contact with the contact device upon the car, and a guard mounted adjacent to the pick-up plow
30 for preventing the displacement of the said movable devices as the plow passes under them, for the purpose set forth.

9. In an electric railway, the combination, with a car provided with a contact device, of a
35 conduit having a guide-slot extending along the roadway and movable contacts arranged along the way and adapted to be brought into engagement with the said contact device on the car, and a pick-up plow mounted upon
40 the car and consisting in flexible plates secured together and capable of a slight movement on each other when the plow bends in taking a curve.

10. In an electric railway, the combination,
45 with a car provided with a contact device, of a conduit having a guide-slot extending along the roadway and movable contacts arranged along the way and adapted to be brought into engagement with the said contact device on the car, a hinged pick-up plow mounted upon
50 the car, and a hand-lever connected with the plow for raising and lowering it, and a stop for limiting the downward movement of the plow.

11. In an electric railway, the combination,
55 with a car provided with a contact device, of a conduit having a guide-slot extending along the roadway and a pick-up plow hinged so as to swing vertically and extending into the guide-slot, the hinge-pin of the hinge of the
60 said plow being mounted in elongated slots, so as to permit of a lateral movement of the end of the plow, for the purpose set forth.

12. In an electric railway, the combination,
65 with a car, of a beam mounted upon the car and a contact-rod carried thereby, a swinging supporting-bar hinged to the said beam, and

a pick-up plow mounted upon the supporting-bar, for the purpose set forth.

13. In an electric railway, the combination,
70 with a car provided with a contact device and a pick-up plow, of a supporting-beam for the pick-up plow, mounted upon the car-axles and provided with a spring-seated bearing, for the purpose set forth.

14. In an electric railway, the combination,
75 with a car provided with a contact device and a pick-up plow, of a supporting-beam for the pick-up plow, mounted upon the car-axles and provided with bearings for the axles, the bearings of one said axles being movable horizontally and provided with springs for opposing
80 its movement, for the purpose set forth.

15. In an electric railway, the combination, with a car provided with a contact device and
85 a pick-up plow, of a supporting-beam for the pick-up plow swung from the axles of the car, one of the axles being provided with a horizontally-movable bearing-block mounted on the supporting-beam so as to be movable on
90 the same, and a spring at opposite sides of the block for opposing its horizontal movement relative to the beam, for the purpose set forth.

16. In an electric railway, the combination,
95 with a car, of a beam mounted upon the running-gear and a contact-rod carried thereby, a supporting-bar mounted upon the beam, and a pick-up plow hinged to the supporting-bar, substantially as and for the purpose set forth.

17. In an electric railway, the combination,
100 with a car provided with a contact device and a pick-up plow, of a conduit formed with a guide-slot for the pick-up plow and comprising two vertically-arranged plates or members disposed parallel with a space between
105 them, forming the slot, a railway-track crossing the conduit, with the ends of the abutting rails slightly spaced on the vertical plane containing the guide-slot, and a spacing-plate
110 interposed between the plates forming the conduit and passing between the ends of the said crossing-rail, substantially as and for the purpose set forth.

18. In an electric railway, the combination,
115 with a car provided with a pick-up device and contact mechanism, of arms or levers pivoted parallel with the car-tracks for controlling the circuit and adapted to be elevated by the pick-up device on the car, so as to make contact
120 with mechanism on the car, for the purpose set forth.

19. In an electric railway, the combination, with a car provided with a pick-up device and contact mechanism, of a subterranean insulated main conductor provided at intervals
125 along the way with normally-disconnected branch conductors adapted to be placed in circuit with circuit-completing mechanism on a passing car, and pivoted levers for the branch
130 conductors arranged parallel with the tracks and provided upon their ends with contacts adapted to be placed in contact with the said mechanism on the car by means of the pick-

up device, substantially as and for the purpose set forth.

20. In an electric railway, the combination, with a car provided with a pick-up device and circuit-completing or contact mechanism, of a subterranean branch conductor provided at intervals along the way with normally-disconnected insulated branch conductors, and pivoted levers, over which the branch conductors pass, located in the road-bed parallel with the track and provided at their ends with a laterally-projecting contact-arm adapted to be engaged by the said pick-up device and raised in contact with the said mechanism on the car, for the purpose set forth.

21. In an electric railway of the class described, the combination, with a casing placed in the road-bed, of a lever pivoted by one end in said casing and provided at its other end with a contact, the said lever adapted to move in and out of the casing and consisting in a broad plate or blade, which in all positions of its movement serves to close the opening of the casing through which the blade moves, whereby foreign matter may be prevented from falling into the casing, for the purpose set forth.

22. In an electric railway, the combination, with a casing placed in the road-bed, of a lever for the branch conductor, pivoted in the casing and adapted to move in and out thereof, the said lever consisting of a broad plate or blade which closes the opening of the casing through which it moves in all positions of its movement, the interior of the said casing being wider at the bottom than at the top, whereby foreign matter in the bottom of the casing may not prevent the lever from moving to its lowest position, for the purpose set forth.

23. In an electric railway, the combination, with a casing placed in the road-bed, of a switch having a switch-box removably mounted in one end of the casing and provided with a shaft for operating the switch, and a lever for the branch conductor, pivoted by one end in the casing and connected to and moving with the said shaft of the switch-box, the lever and switch-box together being removable from the casing, substantially as and for the purpose set forth.

24. In an electric railway, the combination, with a branch conductor and a pivoted lever over which the conductor passes, provided with a contact, of a switch located in the branch conductor and comprising a shaft turning with the said lever, a spring contact-arm extending from said shaft so as to be rotated therewith, and a fixed contact for the contact-arm to engage with, substantially as and for the purpose set forth.

25. In an electric railway, the combination, with a switch mounted in a water-tight switch-box consisting in a box having a fixed tubular shaft extending laterally therefrom, of a switch-shaft extending loosely through said tubular shaft and provided in the switch-box

with a contact-arm, a lever for the branch conductor, mounted so as to swing upon the said fixed shaft, and a water-tight cap secured to said lever and to the end of the switch-shaft and covering the end of the said fixed shaft, substantially as and for the purpose set forth.

26. In an electric railway, the combination, with a pick-up plow and a contact device carried by the car, of a conduit 44, formed with a guide-slot 43 and extending along the roadway, the crossing-rails 88 88, extending at an angle to the conduit, with the abutting ends thereof suitably spaced at the crossing-point, and a spacing-plate 87, provided with a curved or bowed upper edge and placed within the conduit, substantially as and for the purpose set forth.

27. In an electric railway, the combination, with a car, of the supporting-beam 51, mounted upon the car-axles, the bearing of one of the axles on the said supporting-beam being movable horizontally thereon and provided with the springs 75 75 for opposing the movement thereof, substantially as and for the purpose set forth.

28. In an electric railway, the combination, with movable contacts arranged along the roadway and a car provided with a pick-up plow for engaging and elevating said contacts, of the supporting-beam 51, mounted upon the car-axles with yielding connection therebetween, and the contact-rod 18, suspended from the said beam and acting in conjunction with the said plow, substantially as and for the purpose set forth.

29. In an electric railway, the combination, with a car provided with a contact device, of the operating-levers pivoted in the roadway and a flexible pick-up plow comprising the plates 55 55, secured together, substantially as and for the purpose set forth.

30. In an electric railway, the combination, with a car provided with a contact device, of the operating-levers pivoted in the roadway, the plate 47, mounted on the car and hinged so as to swing vertically, the plow-arm 52, mounted thereon and insulated therefrom, a pivoted hand-lever 61, connected with the plow for raising and lowering it, and a lock for holding the plow in raised position, substantially as and for the purpose set forth.

31. In an electric railway, the combination, with a car provided with a contact device, of operating-levers pivoted in the roadway, a plow-arm 52, mounted upon the car, and a guard 56 57 therefor, substantially as and for the purpose set forth.

32. In an electric railway, the combination, with a car provided with a contact device and a hinged pick-up plow swinging vertically, of operating-levers pivoted in the roadway and a hand-lever 61, pivoted thereto for raising and lowering the plow and provided with a lock for locking it in raised position, said lock connected with and controlled by the pivoted handle 68, substantially as and for the purpose set forth.

33. In an electric railway, the combination, with a car provided with the supporting-beam 51, formed with a bearing 59, of a pivoted horizontally - swinging supporting - bar 49, 5 formed with a projection 60 and mounted upon said beam, and a pick-up plow carried thereby, substantially as and for the purpose set forth.

34. In an electric railway, the combination, 10 with a car, of a supporting-beam 51, mounted thereon, the swinging supporting - bar 49, hinged horizontally thereto, the said beam overlapping the bar and a sliding joint therebetween, and a pick-up plow mounted upon 15 the supporting-bar 49, substantially as and for the purpose set forth.

35. In an electric railway, the combination, with a car, of the supporting-bar 49, hinged horizontally, and a pick-up plow mounted 20 thereon, and a contact-rod 18, supported beneath the car and having its end pivoted to the said supporting-bar, substantially as and for the purpose set forth.

36. In an electric railway, the combination, 25 with a casing 37, formed with a chamber 38, having an opening 39, of a pivoted operating-lever 21, provided with a contact upon its end, the switch-box 23, secured thereto, and a switch within the box, the said lever and 30 switch-box mounted movably in the said casing, and a branch conductor 20, leading from the main through the switch and over the lever 21 to the contact carried thereby, substantially as and for the purpose set forth.

37. In an electric railway, the combination, 35 with a casing 37, formed with a chamber 38, having an opening 39, of the swinging operating-lever 21, carrying a contact, and the branch conductor leading over the lever to the contact, said lever acting to fill the open- 40 ing 39 at all times, substantially as and for the purpose set forth.

38. In an electric railway, the combination, with the casing 37, of the switch-box 23, 45 mounted therein and provided with a tubular shaft 25, fixed thereto, the rotary switch-shaft 26, mounted in the said tubular shaft 25, the lever 21, turning with the switch-shaft, and a switch controlled thereby, substantially 50 as and for the purpose set forth.

39. In an electric railway, the combination, with the casing 37, of the switch-box 23, 55 mounted therein and provided with the fixed tubular shaft 25, the rotary shaft 26 for controlling a switch within the box, said rotary shaft mounted through the said hollow shaft 25, the lever 21, mounted upon the shaft 25, and the cap 30, connecting the lever with the said switch-shaft 26, and a switch controlled by 60 said lever 21, substantially as and for the purpose set forth.

In testimony whereof I have hereunto set my hand, this 10th day of November, 1890, in the presence of the two subscribing witnesses.

FRANK MANSFIELD.

Witnesses:

W. C. JORDAN,
CHAS. O'REILLY.